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AGRICULTURAL NEWS LETTER

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THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

Zinc is Essential to Plant Growth Experiment Station Research Shows.

Opening of Industrial Toxicology Laboratory Inaugurates Significant Scientific Research.

The Potato Crop, Some Diseases and Seed Disinfection with Formaldehyde.

New Facts About Fertilizer Materials Result from Research and Experiments.

Kansas Oats Yields Increased 31.9 percent by Treating Seed with Organic Mercury Dust.

Blasted Ponds to Provide Water Supply as Drought Insurance for Many Farmers.

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Wilmington, Del.

ZINC IS ESSENTIAL TO PLANT GROWTH

EXPERIMENT STATION RESEARCH SHOWS

EDITOR'S NOTE:- This article was prepared by three of the specialists of the Office of Experiment Stations, James T. Jardine, Chief. The results described are typical of the accomplishments of research by the agricultural experiment stations and the United States Department of Agriculture on the general subject of plant nutritional disorders and the development of curative treatments.

Bringing to light the complete story of the food requirements of growing crop plants has been one of the major activities of the State Agricultural Experiment Stations for a long period of years. The earlier knowledge of agricultural science and practice indicated that the nutrient elements necessary for the growth and prosperity of crop plants were limited to the rather well-known elements calcium, carbon, hydrogen, iron, magnesium, nitrogen, oxygen, phosphorus, potassium, and sulfur. However, from time to time crops have begun to fail to produce well on apparently suitable soils under favorable climatic and other conditions. These unexplainable occurrences, mysterious to the farmer, have spurred the scientists of the agricultural experiment stations and the Department of Agriculture to search for the cause. In a number of cases the cause has been determined to be a growing deficiency in the soil of some element that no one had hitherto suspected to be necessary in the nutrition of the crop, and a number of these elements have been added to the list.

One of the more recent important additions to the list of elements found to be necessary for certain crops, particularly fruits, is zinc in the well-known form of zinc sulfate. Zinc sulfate has long been used for numerous purposes as an industrial chemical and as a constituent of various medical preparations. The discovery of its previously unsuspected effectiveness both in preventing and reducing the severity of physiological disorders in fruits and other crop plants and in promoting normal, vigorous growth and production has been of immense practical importance not only in the production of quality crops at a lower cost by farmers, but in adding to the business of the chemical industries supplying the zinc itself.

Twenty years ago it was established that zinc was essential to the normal growth of corn under certain conditions. Many years elapsed, however, before the full significance of the finding in agricultural production was fully appreciated. Years later the California Experiment Station found that the elements boron and zinc not only stimulated plant growth but were essential elements in the nutrition of a wide range of the higher crop plants. More recently, the Kentucky

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Experiment Station showed that zinc is essential to the growth and development of certain yeasts and molds and the Oregon Experiment Station found that manganese, zinc, and iodine increase the yields of crops under certain conditions.

With this evidence that zinc is important as a plant nutrient, it is not surprising therefore that the California Experiment Station recently adopted the use of this element as a means of preventing important economic disorders of fruit trees known under various local names as little leaf, rosette, and chlorosis. In California and other Pacific Coast States large acreages of various fruits and nuts such as walnuts, citrus, grapes, apples, and peaches, of immense total value, were being rendered unprofitable by these disorders. After long and painstaking research with many materials the California Station found that zinc is the effective element when used either alone or as an impurity in other materials for treatment of the soil or the plant directly. Effective control of the little leaf disorder of fruit trees was secured by placing zinc sulfate crystals in holes bored in the trunks of the trees. In certain fruits, particularly grapes and citrus, benefits were secured from spraying with a solution of zinc sulfate, which was interpreted to indicate that the plants normally required more zinc for their nutrition than the soil could supply.

The results of these researches by the experiment stations in California and neighboring states were so striking as to pave the way for the solution of puzzling nutritional problems with various other important crop plants in other sections of the country. This created new demands for zinc sulfate. The U. S. Department of Agriculture working in cooperation with the Indiana Experiment Station showed that the use of zinc sulfate lessened the damage caused by bacterial spot of peaches over a wide area. An instance of the practical effect of this research on the chemical industry was the case of one peach grower who recently used 24 tons of zinc sulfate in his orchard.

The effective treatment of tung oil trees affected with the disorder known as bronzing also was developed by the Florida Experiment Station in connection with its researches on the propagating, planting and fertilizing of these trees. This disorder caused dwarfing and premature defoliation of the tung oil trees resulting in lowered vigor and productiveness. Beneficial results were obtained both from applying zinc sulfate to the soil and from spraying the tung oil trees, indicating a natural deficiency of zinc in the soil. The Florida Station also found the zinc sulfate treatment to be distinctly beneficial to orange and pecan trees affected with rosette.

References

Plant Physiology Vol. 1 (1926), No. 3, pp. 231-249.
American Society Horticultural Science Proceedings, Vol. 28 (1928), Vols. 32 and 33 (1932 and 1933).
Florida Experiment Station Annual Report 1933, pp. 91-95.
U. S. D. A. Technical Bul. 273 (1932), p. 49.

OPENING OF INDUSTRIAL TOXICOLOGY LABORATORY

INAUGURATES SIGNIFICANT SCIENTIFIC RESEARCH

EDITOR'S NOTE:- The new laboratory, described here, has been established to meet pressing need for reliable and extensive data on industrial toxicology. Its work, however, will not be without importance in the agricultural field, since there will be investigations of the toxicity of insecticides, seed disinfectants and other products in wide use by growers of farm and orchard produce. Prior to the founding of this laboratory, the only other one of its kind anywhere was in Germany, where research has been carried on within comparatively limited scope.

With the opening of the Haskell Laboratory of Industrial Toxicology, near Wilmington, Del., on January 22, research along lines of industrial toxicology was inaugurated on a scale never before attempted anywhere in the world. The laboratory has been founded by E. I. du Pont de Nemours & Company. It is located on the grounds of the du Pont Experimental Station.

The scope of research to be pursued -- with special references to its industrial aspects -- will comprise exhaustive study and experimentation as to the nature of specific poisons, their morbific effects, detection in organs and tissues, antidotes, and the treatment of diseases resulting from exposure to such poisons.

Although the work of the laboratory will be largely concerned with studies in the possible toxicity of various products of the du Pont Company and its subsidiaries, in either the making or the uses of the products, the data obtained in many cases may be of general value, especially to the medical profession, and be useful to the diversified chemical industry as a whole. In this connection it is to be noted that there is at present comparatively little scientific data on possible deleterious effects on humans of some of the entirely new chemicals, chemical compounds and synthetic products used not only in industries but in the home, as well.

One of the many phases of the extensive research program will be concerned with insecticides, fungicides, seed disinfectants and other chemical products used for agricultural purposes. This will relate both to any possible hazards in the handling of such products by users or those engaged in manufacturing them, and to any danger to consumers of fruits, vegetables and the like because of residue.

An Adequately Staffed Laboratory -

The director of the laboratory is Dr. W. F. von Oettingen. Dr. von Oettingen got his chemical training at the Universities of Jena and

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Goettingen, Germany, under the direction of Ludwig Knorr and Otto Wallach, two outstanding chemists in Germany.

After receiving his Ph. D. degree, he studied medicine with the aim of taking up the study of the relations between chemical constitution and pharmacological action. He finished the pre-clinical course in medicine in Goettingen and then entered the University of Heidelberg, where he specialized in internal medicine and pharmacology under the direction of Rudolf Krehl and Rudolf Gottlieb.

He came to this country in 1924 and in 1925 joined the staff of the medical school of the Western Reserve University in Cleveland, Ohio, where he was teaching pharmacology and did research especially in regard to the relation between chemical constitution and pharmacological action.

The principal associates of the director are Dr. W. C. Hueper and Dr. F. H. Wiley.

Dr. Wilhelm C. Hueper is a graduate in medicine from the University of Berlin and was at the Pathological Institute of the Augusta Victoria Krankenhaus in Kiel until 1923. In 1924 he came to this country, and for six years was the pathologist and director of the laboratories of Mercy Hospital in Chicago, and assistant professor of Pathology at Loyola University; from 1930 to 1933 he was associated with the Cancer Research Laboratories of the University of Pennsylvania. He has not only a complete medical training and experience with human pathology, but he is also experienced in animal experimentation and animal pathology and has had considerable experience in the work on cancer.

Dr. Frank H. Wiley is a graduate in chemical engineering from the University of Denver, and received his Ph. D. in biochemistry at Ann Arbor, and has had the National Research Council Fellowship at the University Hospital at Ann Arbor. He has considerable experience along biochemical lines and also in the fields of biophysics and physical chemistry.

A staff of highly trained workers will assist in carrying on exhaustive research.

Name Honors du Pont Vice President

The laboratory was named in honor of Harry G. Haskell, a vice president of the du Pont Company. Mr. Haskell's advocacy of the development of facilities to study problems relating to the health of employes resulted in the organization of the Medical Department of the Company years ago when he was directing the work of the High Explosives Department and encountered industrial health problems for the solution of which he sought medical advice.

A three story building was erected to house the laboratory which consists of thirty units.

THE POTATO CROP, SOME DISEASES AND SEED DISINFECTION WITH FORMALDEHYDE

EDITOR'S NOTE:- This is the second article of a series written by Mr. Ressler. Another article will appear in an early issue of the Agricultural News Letter.

By I. L. Ressler, Entomologist,
R. & H. Chemicals Department,
E. I. du Pont de Nemours & Co.

Errata --- The author wishes to correct a misstatement in the article "Discovery and Development of Formaldehyde and Its Applications to Seed Disinfection," which appeared in the January issue of the Agricultural News Letter. To be strictly accurate, the last half of the third paragraph on page six should read:- "In the United States, Arthur of Indiana independently discovered the fungicidal action of formaldehyde for potato scab. In the same year, Prof. Bolley of North Dakota called attention to its value for seed treatment."

We are indebted to Dr. J. H. Skinner, director, Purdue University Agricultural Experiment Station, for calling attention to the error.

Introduction

The potato industry in the United States involves the production of an early or truck crop and a late or main crop. The late crop, which constitutes about 85 percent of all the potatoes raised in the United States, is grown in the North. This crop is of far greater importance commercially than the early crop, which in general is limited to the Southern states.

The fact that the late crop is largely restricted to the North is not due to accidental circumstances. It is recognized that potatoes thrive best in regions where irrigation water is available or where there is ample rainfall well distributed throughout the growing season. Such conditions are more generally found in the Northeastern states and in some of the more elevated sections of the West.

During 1933 the total potato crop amounted to 317,143,000 bushels. This is considerably lower than during normal years since the crop was materially reduced due to unusual drought conditions. Of this total 180,623,000 bushels, or 56.9 percent of the crop, were produced in Maine, New York, Minnesota, Pennsylvania, Michigan, Idaho, Wisconsin and Colorado, each state ranking in the order named. During a period of years the relative importance of the producing states may vary but for the all practical purpose the eight states mentioned are considered the principal late-crop producing areas.

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Selecting the Variety to Grow

In selecting a variety of potato to grow, it is necessary to consider whether the potato is desired for home or market purposes. For market purposes usually a selection of potato that will thrive well under local growing conditions and have good storage properties is chosen. The wisdom of confining the growers' efforts to one or two varieties cannot be overemphasized. Community action in this connection may often open a market for growers that will attract buyers and tend to build a steady and stabilized market that will become a regular source of income.

Selecting the Seed

The selection of good seed potatoes is a prime essential to assure a high producing, quality crop. The old-time practice of using for seed what has been left over from the previous season's crop has been discontinued for the most part by the larger growers. That ancient procedure should be done away with entirely if the grower desires maximum yields and quality year after year. Good seed which may be obtained only by the most careful selection is defined by Dr. William Stuart, U. S. Bureau of Plant Industry, in United States Farmers Bulletin, No. 1064, as follows:-

> "Good seed may be described as that which is pure with respect to the variety; is produced by healthy, vigorous, heavy-yielding plants grown under favorable climatic conditions; and is somewhat immature, reasonably uniform in size and shape, and firm and sound, with the first sprouts beginning to develop at planting time."

Such seeds are now grown and sold in many places as "certified seed." Seed sold as such has been inspected during the growing season and found to be true to variety and relatively free from diseases which might be transmitted to the new crop. Other factors enter into the production of good seed but the scope of this article does not permit of a detailed discussion.

Diseases of Potatoes

Potatoes are subject to more than sixty diseases, some of which may be transmitted through seed from generation to generation and others may be transmitted from infected soil. The most common disease and perhaps the oldest and easiest recognized is scab which manifests itself in several forms and may be classified as black scab, corky scab, powdery scab, silver scurf, or wart. Scab lowers the quality of potatoes and reduces the yield. Continued growing of scabby potatoes in one area so infects the soil, which is the normal medium for propagating the scab organism, that it often becomes impossible to grow scab free potatoes without moving growing operations to a new area. Seed disinfection, a subject to be discussed below, will protect against scab.

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Blackleg, another disease, is caused by seed borne bacteria and is manifested in the form of undersized, weak plants which gradually wither and die. An affected plant when pulled up will show an inky-black discoloration from its base up to one or more inches above the ground. Seed disinfection will control this trouble.

Other common diseases such as mosaic (several types) early and late blights, bacterial blight, fusarium wilt, tip burn and numerous others may be controlled by various cultural and spray practices. None of these will be discussed here because of lack of space. Numerous Government and State Agricultural Experiment Station Bulletins are available on the subjects and can be readily obtained.

Seed Disinfection with Formaldehyde

Seed disinfection should be regarded as a necessary step in potato culture. In many sections, half of the seed potatoes planted each year may be infected with some disease among which scab, in one or more of its forms, and blackleg are most common. Disinfection with formaldehyde is recognized as the most effective control for scab except in those areas where heavy infections occur in the soil. Under such conditions growing operations should be moved to clean soil whenever possible, always keeping in mind that formaldehyde disinfection will tend to keep the soil free from the organisms and to aid in the production of clean potatoes of high quality.

When to Treat

Seed potatoes are usually treated just before planting. The work may, however, be done with equal success at any time in the winter or spring provided the potatoes are properly dried and are not reinfected by storing in old containers or bins which have not been disinfected. It is in fact an advantage to treat some time in advance of planting so that if the sprouts are injured, new ones may form.

Presprinkling is Important

The black scurf or sclerotia of rhizoctonia on the tubers are composed of hard compact fungus tissue. Experiments conducted at the Idaho Agricultural Experiment Station have shown that it is extremely important to wet the tubers with water and keep them covered about 48 hours before treatment. This procedure starts the growth of the fungus and any treatment is rendered much more effective thereby.

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The Hot Method

The hot Formaldehyde method of treating seed potatoes is especially satisfactory when large quantities of seed potatoes are to be treated for it saves a considerable amount of time. Other advantages are that the solution is not poisonous, and does not corrode metals, permitting the use of metal tanks. Furthermore, the solution does not weaken with use and can be used indefinitely if some more of the solution is added at intervals to replace that which has been carried off on the tubers.

Directions:- Soak uncut seed potatoes three to four minutes but no longer in a solution of one pound Formaldehyde to fifteen gallons water heated to 124 - 126 degrees F. The temperature must be kept within these limits during the treatment and it is essential to use an accurate thermometer. After the potatoes are removed from the solution they should be allowed to drain off, covered with canvas for one hour after treating to hold the Formaldehyde gas around the potatoes, then allowed to dry.

Cold Method of Treating Potato Scab

For many years Formaldehyde has been used in cold water solution for the elimination of potato scab. This form of treatment is efficient for this disease but it is not recommended for treatment of black scurf or rhizoctonia.

Directions:- Soak the uncut tubers one and one half hours in a solution of one pound formaldehyde and thirty gallons of water. This soaking period may be decreased to one half hour and effectiveness increased if the tubers are first dipped in or sprinkled with water and covered with burlap sacks to keep them moist for a day or two before treatment.

Tank and Equipment Suggestions

Small lots of potatoes can be readily treated in a common wash boiler on a cook stove. For larger lots a 60 - 80 gallon tank may be used in which a sheet iron heater is placed.

Any kind of a tank - wood, metal, or concrete - may be used. A large tank is desirable because of the greater ease with which a relatively large volume of water is maintained at a uniform temperature. For large capacity treatment, a convenient size for the tank is three and one half to four feet wide, two and one half to three feet deep, and twelve to fourteen feet long. Such a tank will permit eight sacks to be in the solution all the time. By adding a sack at one end and removing one at the other end each half minute the desired four minute treatment is obtained. By this method a carload may be treated in three to five hours.

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A false slat floor a few inches high should be placed in the bottom of the tank to protect the potatoes from scorching and also to provide a place for the settlement of any mud washed off the tubers.

Potatoes may be treated in crates, wire baskets or in bulk. If containers are used, the work is less laborious if there is an overhead scaffolding and pulleys for removing the potatoes from the solution.

For the treatment of very large quantities of potatoes another labor and time saving device is the belt conveyor. The belt is slow moving and time regulated to keep the potatoes in the hot Formaldehyde solution for the entire treatment time. It can be used when potatoes are to be treated either in bulk or in sacks.

Heating

The three general methods of heating this solution are by steam, gas or oil burners, and wood or coal fires. Of these the last named is the least desirable.

Steam is used by applying it either directly into the solution as live high pressure steam or by running it through a coil of pipes placed in the tank. If a coil is used it should be made somewhat oversize, so that the temperature can be brought up quickly. A satisfactory source of steam can be secured in almost any community from portable engine boilers, or from boilers used in creameries, mills, power plants, etc. For efficiency, the treating tank should be as close as possible to the source of the steam. A cut-off valve on the steam line should be placed close to the tank.

Seed Treating Machine

There are a number of seed treating machines available. Most of these are quite satisfactory in operation and while more convenient do not necessarily provide more efficient treating than the improvised home outfits.

Preparation of the Solution

Add water to the tank until it is two-thirds full, measuring or estimating in gallons the amount of water used. (one gallon equals 231 cubic inches) Mark this water level on the tank. Add one pint of Formaldehyde to every fifteen gallons of water and the solution is now ready for use.

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Some of the solution is lost during the process by adherence to the potatoes in the course of treatment. These losses can be replaced in the tank by adding from a reserve supply of the prescribed strength. This reserve supply kept in a barrel conveniently close at hand can be also added if it is necessary to lower the temperature in the tank.

When live steam is used the solution is diluted by condensation moisture, consequently full strength Formaldehyde should be added to the solution in the tank at intervals in order to keep the proper strength within the tank. The addition of one pint of Formaldehyde for each fifty-five bushels of potatoes treated is sufficient. This solution should be kept up to the proper volume by adding water up to the water level line previously marked on the tank.

Dirt washing off the potatoes accumulates and interferes with the heating of the solution. Thus to get the best results the treating equipment should be cleaned out at the end of each day and a fresh solution started the following day.

Special Precautions

1. - Control the temperature accurately by means of a tested thermometer. A floating dairy thermometer is most satisfactory.

2. - Time the treatments exactly - do not guess.

3. - Spread the treated potatoes out on a disinfected floor or in disinfected containers to drain and dry. The floor or containers can be disinfected by washing with formaldehyde solution made up in the same strength as for potato disinfection.

By using care, any injury or delay in germination can be prevented.

NEW FACTS ABOUT FERTILIZER MATERIALS

RESULT FROM RESEARCH AND EXPERIMENTS

EDITOR'S NOTE: - Since space does not permit the use of the entire paper from which the abstracts below are taken, it is recommended that those interested in fertilizer materials and fertilizer uses obtain complete copies. Reprints may be secured from the office of the AGRICULTURAL NEWS LETTER, Room 9122, Du Pont Bldg., Wilmington, Del. In the March issue will be printed a discussion of plant food concentration as a factor in the retail prices of fertilizers.

The abstracts which follow are from a paper, "Adaptation of Fertilizers for Cotton Soils," by Oswald Schreiner and J. J. Skinner, Division of Soil Fertility, U. S. Department of Agriculture. This paper was presented before the Division of Fertilizer Chemistry at the meeting of the American Chemical Society, Cleveland, September 11, 1934. The tables referred to in this discussion are omitted here because of lack of space. Of course, the tables appear in reprints of the paper which are available.

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The efficiency of commercial fertilizers for cotton soils is possibly determined in a large measure more by the ratio of nitrogen, phosphoric acid and potash and the form of nitrogen in the fertilizers than any other factors. Since the decrease of the available supply of organic nitrogen from vegetable and animal by-products for fertilizers, the introduction of synthetic nitrogen salts and the manufacture of cheaper mineral nitrogen, considerable experimentation has been in progress to study the effects of various sources of nitrogen and mixtures of these for southern soils and how to use them to best advantage in mixtures with phosphoric acid and potash. Results of such work, conducted by the State Experiment Stations of the cotton belt and the U. S. Department of Agriculture, have been reported from time to time. This work is of paramount importance as more commercial fertilizers are used in the growing of cotton than any other American crop. In fact, in the southeastern section of the cotton belt more fertilizer is used than in all the rest of the United States. In this section of the cotton belt, the yield of cotton may be at least doubled and sometimes tripled through the application of large quantities of commercial nitrogen with mineral fertilizers.

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Table one gives the ratio of N-P_2O_5-K_2O that produced the highest yield of seed cotton on eight prominent soil types. Since the work was inaugurated when ammonia (NH_3) formed the basis of percentage composition in whole numbers, the presentation on the nitrogen basis is of necessity in fractions, thus three percent NH_3 becomes approximately 2.5 percent N. The average ratio of the three highest yielding plots is also given and may be considered the more reliable index to the optimum fertilizer ratio for the different soils. These soil types are representative of large areas in the southeastern cotton belt. An average of these eight soil types approximates a ratio of 5-7-2 for the average fertilizer composition. The different soil types naturally vary from this average mean composition in the various fertilizer elements according to the different soil conditions.

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Time of Application of Nitrogen

In Table three are presented some results of experiments in which it was attempted to adjust, as far as practicable, the nitrogen sources to obtain best results, using sodium nitrate, ammonium sulphate and mixtures of these two alone and with various organic ammoniates, on two typical cotton soils occurring in large areas in the southeastern cotton belt.

Considering the two inorganic sources of nitrogen, the highest yields are obtained from the sodium nitrate having a slightly basic equivalent. The ammonium sulphate with its high acidity equivalent gives the low yield. In the mixtures, the acidity equivalent is directly correlated with the yield in both soils. In the mixtures with the organics the equivalent acidity is low and the yield is correspondingly high in both soils.

Special attention should be called to the observation that when the mineral sources are mixed so as to have a low acidity equivalent, the yield results are as good as those obtained with the more expensive organics in the mixture.

This agronomic result is not without important economic significance, since it would seem to place the cheaper inorganic and synthetic nitrogen sources when properly balanced with basic materials on a par in crop producing value with more expensive organic ammoniates of vegetable and animal waste products. The cost of mineral nitrogen is approximately 1.20 per unit, while that of the natural organics is 3.28 per unit, according to the 1934 price schedule.

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In Table four is presented a time of application study on an important cotton soil of the Coastal Plains over a period of three years. It will be seen that in nearly every instance the original application of fertilizer containing all of the nitrogen, whether the source be sodium nitrate, ammonium sulphate or urea, gave as good if not better results on this soil than the delayed or split applications.

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It would seem, therefore, that it may be more economical to apply all fertilizer at planting time and that the economies in manufacture suggested by the report of Ross and Mehring are feasible from an agronomic as well as from a manufacturing point of view and presage an important economic advance to the cotton grower, on certain soils. This involves the use of cheaper inorganics properly blended and neutralized with basic materials, putting all the nitrogen needed by the crop into the fertilizer, necessitating, however, applying the same with somewhat more caution at planting time as to proper placement in relation to the seed.

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SUMMARY

The adaptations of fertilizer composition and proportions of plant foods to meet the requirements of cotton soils is discussed. Experiments are cited to show that inorganic sources of nitrogen may be as effective for cotton production as higher priced organic ammoniates, thus effectively reducing the fertilizer cost to the comsumer. Delayed nitrogen fertilizer applications appear not tc be more efficient than full applications in the fertilizer at planting time, thus effecting further economies in farm labor. Properly blended fertilizer salts, together with basic materials in the preparation of concentrated fertilizers, avoiding high acidity equivalents, may be as efficient on cotton soils as ordinary fertilizers, but at a lower cost for equivalent plant food.

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Table 2. The Equivalent Acidity of Commercial Mixed Fertilizers Produced in 1935, as Determined from the Materials Used in Making Them

Tons of material	Material	Analysis			Tons of plant food			Tons of $CaCO_3$ equivalent	
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	acidity	basicity
304,408	Ammonium sulphate	20.68			62,952			336,793	
28,900	Ammonium phosphate	11.00	48.00		3,179	13,872		17,008	
25,000	Ammoniating solutions	41.00			10,250			18,450	
13,508	Anhydrous ammonia	81.50			11,009			19,816	
5,000	Ammonia liquor	21.00			1,050			1,890	
3,000	Urea	46.03			1,381			2,486	
400	Calurea	33.78			135			155	
32,406	Cyanamid	22.40			7,259				20,688
163,118	Nitrate of soda	15.95			26,017				46,831
13,000	Calnitro	18.25			2,372				1,425
5,000	Nitrapo	15.03		13.93	752		697		1,354
1,575	Potassium nitrate	12.96		44.50	204		701		367
99,965	Process tankage	8.42	.66	.11	8,417	660	110	14,309	
53,991	Dried fish scrap	9.60	6.50	.77	5,183	3,509	416	2,592	
29,890	Acid fish scrap	6.71	5.93	.39	2,006	1,772	117	1,003	
41,863	Animal tankage	7.49	10.23	.37	3,136	4,283	155		
6,000	Dried blood	13.09	1.64	.68	785	98	41	1,374	
49,499	Cottonseed meal	6.50	2.30	1.80	3,217	1,138	891	4,665	
41,000	Castor pomace	5.00	1.69	1.10	2,050	693	451	1,948	
20,000	Other seed meals	5.00	2.50	2.00	1,000	500	400	1,000	
18,000	Cocoa shells	2.55	1.00	2.50	459	180	450		
55,441	Garbage tankage	2.77	3.06		1,536	1,696			3,840
11,182	Sewage sludge	3.00	2.00	.60	335	224	67	503	
2,445	Dried goat manure	1.54	1.10	3.08	38	27	75	19	
11,312	Bird guano	10.00	10.00	2.30	1,131	1,131	260	1,074	
2,176	Whale guano	10.43	3.29	.34	227	72	7	102	
1,500	Bat guano	5.73	8.63	2.00	86	129	30	43	
5,135	Other guano	5.00	7.00	2.00	257	359	103	193	
40,000	Other nitrogenous	6.00	1.00	.50	2,400	400	200		
26,002	Bone meal	3.00	25.00		780	6,500			5,720
1,983,000	Superphosphate		18.30			362,889			
40,000	Double superphosphate		44.00			17,600			
328,881	Muriate of potash			50.77			166,973		
51,626	Sulphate of potash			49.30			25,452		
71,000	Kainit & 20% Manure salts			21.21			15,059		
37,000	25% Manure salts			25.50			9,435		
55,000	30% Manure salts			30.26			16,643		
10,000	Sulphate of potash-magnesia			26.10			2,610		
5,000	Vegetable potash	.28	1.48	34.50	14	74	1,725		613
30,000	Other potash-bearing substances			10.00			3,000		
50,000	Tobacco stems	2.00	.70	6.02	1,000	350	3,010		15,000
20,000	Phosphate rock		2.50			500			2,000
36,000	Peat	1.86	.33	.18	670	119	65		2,680
7,000	Limestone (1)								6,300
260,000	Dolomite (2)		.03			82			254,800
7,000	Other liming materials (3)								6,650
400,000	Sand, ashes, etc.								
4,505,223	Total Mixed Fertilizer	3.58	9.30	5.53	161,287	418,857	249,143	425,423	368,266
	Total net acidity							57,157	

(1) Average $CaCO_3$ equivalent 90
(2) " " " 98
(3) Marl, calcined dolomite, etc. $CaCO_3$ equivalent 95

Table 3. Physiological Acidity of Commercial Mixed Fertilizers as Calculated from the Materials Used in Making Them

	Units	1929	1931	1933	1934	1935	1936
Mixed fertilizer production	Short tons	5,316,000	4,204,000	3,400,000	3,870,000	4,505,000	4,960,000
Equivalent acidity of N, P and K materials used	Total in tons $CaCO_3$	339,400	339,000	356,000*	358,000	324,907	342,000*
	Pounds $CaCO_3$ per ton	128	161	209	185	144	138
Equivalent basicity of liming materials used	Total in tons $CaCO_3$	33,300	60,000*	97,000	155,000*	267,750	295,500
	Pounds $CaCO_3$ per ton	13	28	57	80	119	119
Net equivalent acidity	Total in tons $CaCO_3$	306,100	279,000	259,000	203,000	57,157	46,500
	Pounds $CaCO_3$ per ton	115	133	152	105	25	19

*Estimated

KANSAS OATS YIELDS INCREASED 31.9 PERCENT

BY TREATING SEED WITH ORGANIC MERCURY DUST

EDITOR'S NOTE:- A further demonstration of the value of seed treatment for the control of smut in oats has been given in Douglas and Brown counties, Kansas, and described in a report by Gilbert F. Miles, director of research for the Bayer-Semesan Company, from which the following facts were taken. The seed disinfectant used was New Improved Ceresan.

That smut and other diseases cause much larger losses in grain crops than most growers realize is well illustrated by the results of field tests conducted during the past season in Douglas and Brown Counties, Kansas. In the course of investigations by a private research organization, ten lots of seed oats were secured at random from as many farmers in Douglas, Atchison, Jefferson and Brown Counties. Most of the growers from whom samples were collected expressed the opinion that their seed was fairly free from smut.

Five of the lots of oats were planted on the farm of Elmer Flory of Douglas County and five on the S. E. Feller farm in Brown County. Part of each lot of seed was treated and part left untreated. The plantings were made so that yields from treated and untreated seed could be compared.

Smut counts made at harvest time showed the percentages of smut in the plants grown from the untreated seed ranged from 7.8 percent to 30.4 percent, the average for the ten lots being 18.5 percent.

To secure these percentages the investigators examined over 18,000 heads for the untreated and the same number for the treated. Of the 18,000 heads from untreated seed, 3,427 heads were smutty. In other words, out of every 1,000 heads 190 were smutty and represented a total loss to the grower.

Of the 18,000 heads examined for the treated seed there were only 21 smutty heads, the rate being slightly over one smutty head per 1,000.

With nearly one head out of every five from the untreated seed showing smut and only about one head in a thousand smut-infected for the treated seed, there could be little doubt that the treated seed had outyielded the untreated seed by a wide margin. Threshing tests showed that the treated seed had outyielded the untreated

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seed by 31.9 percent. Thus, those growers who took the precaution to disinfect their seed before planting secured nearly one-third more oats per acre than those who planted untreated seed.

It will be noted that while the average percentage of smut in the untreated lots was 18.5, treatment of the seed increased the yield 31.9 percent. Answering the question as to why the increase in yield was so much larger than would be expected from the amount of smut present, investigators point out that modern chemical disinfectants do more for the seed than merely destroy smut. Certain other diseases responsible for seed decay, seedling blights, and root rots are also brought under control by the disinfectants. So prevalent are these latter diseases in grain fields throughout the country that seed treatment usually increases the yield of oats ten to fifteen percent even when no smut is present.

BLASTED PONDS TO PROVIDE WATER SUPPLY

AS DROUGHT INSURANCE FOR MANY FARMERS

EDITOR'S NOTE:- A timely and informative article, "The Farm Water Supply," appeared in the January number of the Southern Agriculturist. It is by F. L. Teuton. The quotations below are from this valuable discussion.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.

Writing on the subject of adequate provision of water for farm uses, especially the emergency ones, F. L. Teuton* says: "We seldom think of the water supply when it is raining. It takes dry weather to make us water conscious. And while nobody wants another drought like we had last summer, or in the summer of 1930, yet there is no denying the fact that, over a long period of years, dry spells occur fairly regularly."

Mr. Teuton further states: "Most farmers know how to make and care for ponds. There are thousands in use and about the only attention they need is an occasional cleaning. You may not use a pond very much unless you have a drought, or unless something goes wrong with the well; but when you need it you usually need it badly. So if you have a place where you can improve a spring, impound a brook, or make a pond, why not do the work this winter while you have time? Then it will be at hand for stock watering, irrigation, orchard spraying, and if need be, for farm or community fire fighters."

Of course, excavations for ponds can be made by hand labor or mechanical means. It is however, the opinion of many agricultural engineers that usually economy of time and money may best be effected by blasting ponds with dynamite.

Ponds of almost any size and depth can be made with dynamite. There are records of numerous pond-blasting performances in which ponds of varying sizes up to 100 feet wide have been excavated, but the very large ponds require ideal conditions. Ponds up to 40 feet wide can be shot economically and speedily in any wet soil conditions.

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The usual plan of shooting a shallow pond is by the cross-section method, but for deeper ponds both the post-hole method and the relief method are used. The choice between the post-hole way and the relief practice depends on the width required in relation to the depth. For the wider pond, the relief method is recommended. In some locations, a combination will give the best results.

Mostly, agricultural engineers are thoroughly familiar with pond-blasting procedure. But it is necessary that these engineers have certain data in order to supply the necessary information on how the work should be done.

Where a pond of considerable size is to be shot, it is advisable to send a detailed description of the excavation required with full information as to the type of soil, dimensions of the pond, and its distance from highways and buildings or other property -- power lines, for instance -- exposed to the action of the explosives.

NOTE:- In an early issue, Mr. Livingston will describe various methods of blasting ponds, and will later give directions for cleaning out ponds and water holes or "tanks," as they are called in some sections.

* "The Farm Water Supply," by F. L. Teuton, January issue, Southern Agriculturist.